Epoch.	Observer.	θ_o	θ_c	$\theta_o - \theta_c$	ρ_o	ρ_c	$\rho_o - \rho_c$
1852·76	Jacob	264°·8	264°·8	0°·0	4″·14	4″·66	−0″·52
1853·96	Powell	263·2	263·0	+0·2	...	4·73	...
1856·09	Jacob	261·1	259·9	+1·2	4·70	4·87	−0·17
1857·96	„	258·1	257·4	+0·7	4·49	5·01	−0·52
1861·03	Powell	253·4	253·6	−0·2	4·86	5·22	−0·36
1870·92	Russell	242·1	242·8	−0·7	5·46	5·85	−0·39
1877·03	Ellery	237·3	237·3	0·0	(5·0)	6·19	(−1·19)
1878·19	Russell	237·0	236·3	+0·7	6·138	6·26	−0·122
1879·93	Hargrave	237·3	234·9	+2·4	5·44	6·37	−0·93
1880·45	Russell	234·7	234·5	+0·2	6·295	6·40	−0·105
1880·58	Tebbutt	233·6	234·4	−0·8	6·42	6·41	+0·01
1882·18	„	233·0	233·1	−0·1	7·01	6·53	+0·48
1885·19	„	230·5	230·8	−0·3	7·10	6·75	+0·35
1886·901	Pollock	229·9	229·6	+0·3	6·63	6·82	−0·19
1886·909	„	230·8	229·6	+1·2	6·85	6·82	+0·03

Further Researches on Stellar Parallax by the Photographic Method. By Professor C. Pritchard, D.D., F.R.S.

In my last communication to the Society I gave the results of an investigation of the parallax of the two components of 61 *Cygni*, each being referred to four comparison stars independently. These eight independent results cohere in a remarkable manner, and together furnish a mean value of the parallax identical with that derived from the determinations of Bessel and subsequent astronomers.

Encouraged by the hopefulness of this new method, I entered on the discussion of the parallax of μ *Cassiopeiæ* and of the Pole Star. The necessity, however, of improving the mechanism of the De La Rue equatorial, now much worn by long and honourable service, greatly interrupted the continuity of the work. Aided by the continued generosity of the original donor this instrument was ultimately restored to very effective order by Mr. Simms, and since its restoration the research has continued without avoidable interruption.

On each of fifty-three nights, four photographic plates were taken of μ *Cassiopeiæ*. The exposures varied from five to ten minutes. About 3 per cent. of these plates were found to be injured and unsuitable for the inquiry. This number of defective plates is so small that, in the work to be presently described, I have adopted the method of taking two impressions on the same plate slightly moved in position, and in this way both labour and expense are economised. Details of all these

researches will in due time be published by the University in a third fasciculus of the Oxford Observatory proceedings. Awaiting this publication I here give simply the results of the investigation.

Two suitable stars, here called (A) and (B), were selected as comparison stars, of approximately the 8th and 10th magnitudes. The resulting parallaxes are as follows:—

From star (A) $\pi = 0''\cdot0501 \pm 0''\cdot0270$.

From star (B) $\pi = 0''\cdot0211 \pm 0''\cdot0235$.

If a correction for the adopted value of the proper motion of μ be omitted, then the respective values are

From star (A) $\pi = 0''\cdot0677$.

From star (B) $\pi = 0''\cdot0429$.

These parallaxes are extremely small, and, taking into account the large proper motion of μ *Cassiopeiæ*, are interesting. Bessel, in 1816, investigated the parallax of this star by means of differences of right ascension on seventy nights, but he arrived at a *negative* value of $0''\cdot12$. It is, however, both proper and interesting to remark that this research and its result apply to a time long anterior to the introduction of the heliometer in 1829. In 1856, Professor Otto Struve obtained a parallax of this star by means of micrometrical comparisons, amounting to $0''\cdot342$; a quantity well within the compass of Bessel's method in 1816.

On reviewing the laborious processes adopted for the determination of the parallax of the preceding stars, it occurred to me that it would be a matter both of interest and importance to inquire what results would be obtained, had the measures been confined to a few nights only, when 61 *Cygni* and μ *Cassiopeiæ* were respectively at their greatest and least apparent distances from the comparison stars selected. Accordingly this method was applied first to 61 *Cygni*, when ten nights of maximum and minimum distance were selected from the entire group of eighty-nine nights. The result was a parallax of $0''\cdot4089$, as compared with $0''\cdot4321$ from the entire series.

The approximate identity of these results induced me to still further reduce the number of nights to five in the case of μ *Cassiopeiæ*, and these gave relatively to the two comparison stars mentioned above the respective parallaxes of $0''\cdot055$ and $0''\cdot095$, in place of $0''\cdot053$ and $0''\cdot021$. The probable errors, however, as was to be expected, are sensibly increased.

Bearing in mind the unavoidably approximate character of even the most elaborate investigations of stellar parallax, and especially when set side by side with the results obtained by this curtailed method, I have resolved (in ordinary cases) to abandon the very laborious processes applied in the case of 61 *Cygni*, and henceforth to limit the observations to five nights in each of four periods of the year, indicated by the position of the paral-

lactic ellipse. It is hoped that by this process the parallax of from ten to fifteen stars at the least will be determined within the year.

Forming my expectations from the experience of the past, I am led to hope that the parallaxes of all stars will in general be determinable by this method when they are not less than the thirtieth of a second of arc; for I find from the calculations of actual instances, that the probable error of a single night's measure of a "distance" does not sensibly exceed the tenth of a second; and inasmuch as the square root of the weight of π derived from the solution of a typical normal equation is 3·6, the probable error of π will not exceed the thirtieth of a second.

In the first instance I propose to apply this method systematically to all those stars between the magnitudes of $1\frac{1}{2}$ and $2\frac{1}{2}$, which attain at Oxford a sufficient altitude, and in fact it is already in course of application to α, β, γ *Cassiopeiæ*, and to γ and ϵ *Cygni*.

Certain cosmical relations cannot be safely inferred excepting from the parallaxes of numerous stars, and for such purposes *classes* of sufficiently approximate parallaxes will be more valuable than somewhat more accurate determinations in isolated cases.

I had hoped to have completed by this time the final determination of *Polaris* by the more elaborate process applied to 61 *Cygni*. The serious interruptions which have been already alluded to necessitate the continuance of the measures until June next. Meanwhile, I may mention that the curtailed process of selected nights has given a parallax amounting to 0″·052; a value which, according to Mr. Maxwell Hall, is close to the mean 0″·043 of all the determinations made by preceding astronomers.

Photographs of the Nebulæ 57 *M. Lyræ*; 27 *M. Vulpeculæ*; *the Cluster* 13 *M. Herculis*; *and of Stars in Cygnus.* By Isaac Roberts.

57 *M. Lyræ.*

Seven photographs of this annular nebula were obtained between July 14 and 31, 1887, with exposures varying between 10 and 60 minutes' duration. The enlargements (one 3 times and the other 25 times) which I now submit are from the negative taken on July 31, with an exposure of 20 minutes. Each of the negatives exposed for 15 minutes and upwards shows with much density the ring. The central star is also visible on each, though it is faintly seen on some; the light is therefore, photographically, very active. The interior of the ring is filled with faint nebulous matter, thus confirming the character given of it by Sir J. Herschel; but there is no evidence